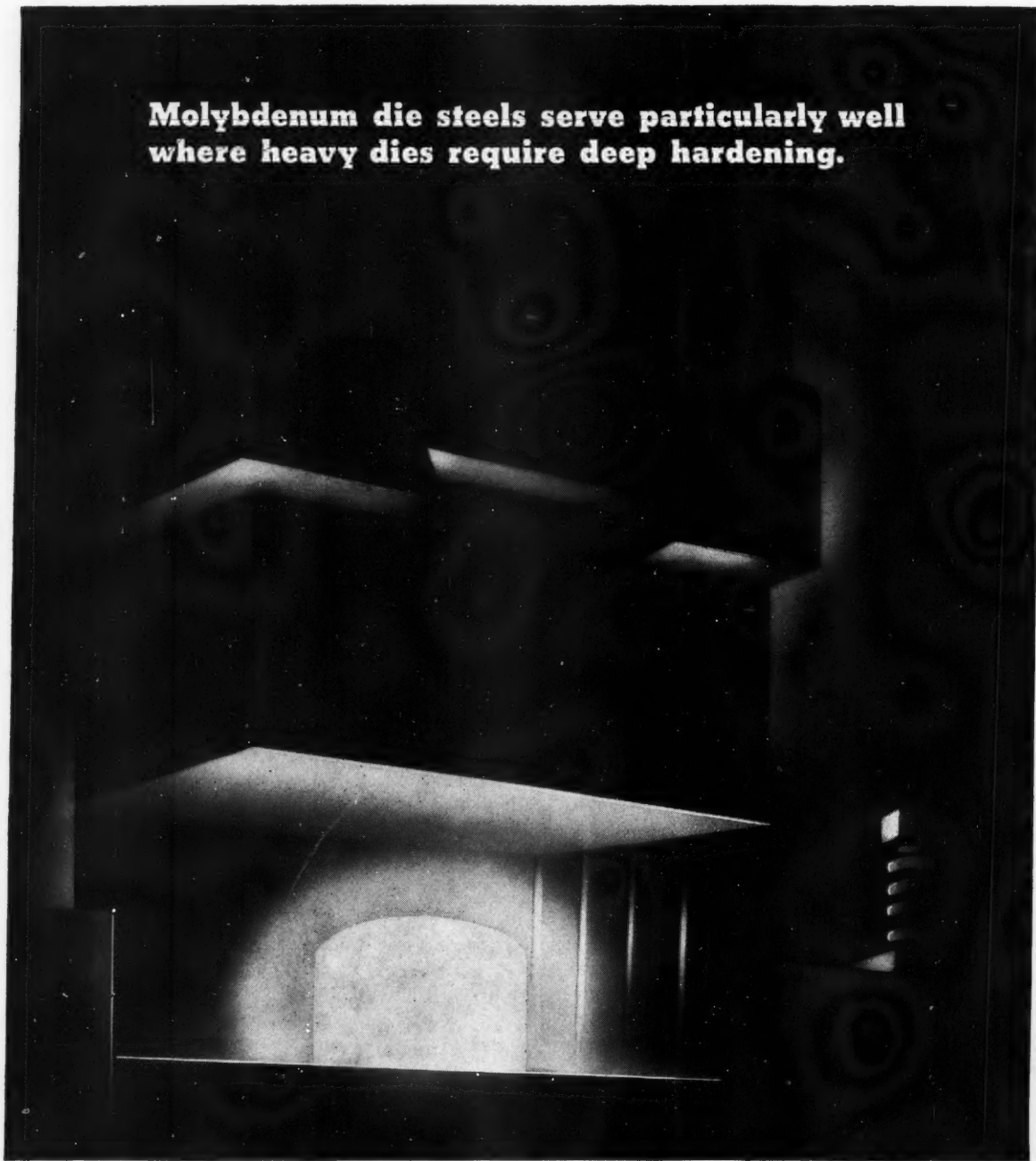


# THE CORNELL ENGINEER



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# The CORNELL ENGINEER

Volume 11

Number 4

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Cover: Winter scene of Fall Creek Gorge.

—Photo by Simmons

Frontis: 160,000 Kilowatt Steam turbine-generator set

—Courtesy of General Electric Co.

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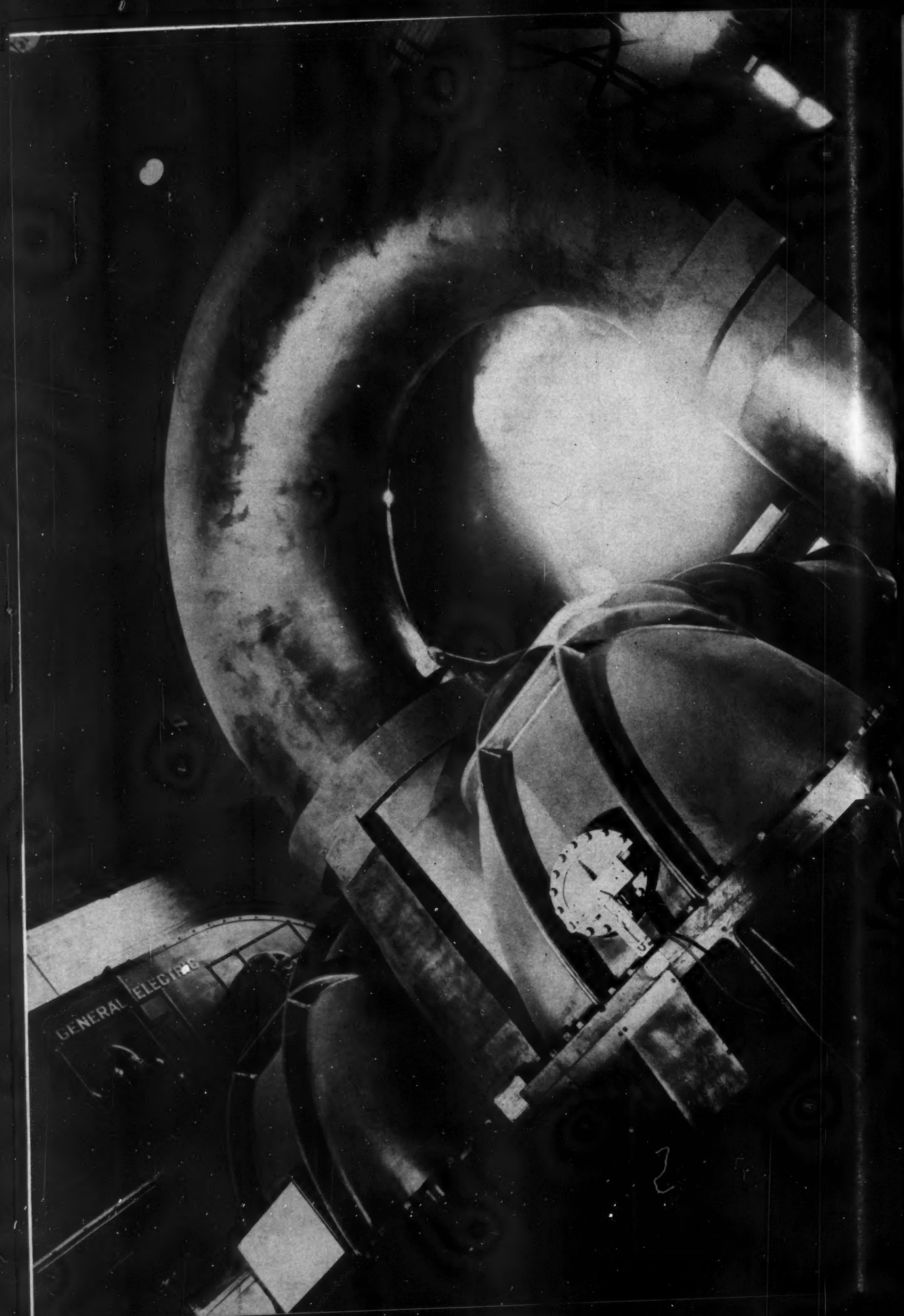
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# THE ENGINEER'S ROLE IN PETROLEUM

By KARL J. NELSON, Chem.E. '39

*All photos courtesy of Standard Oil of New Jersey*

## Editor's Note:

*Now that the war has come to a close many ex-servicemen will be wondering just what good their training in the armed forces will be to them, if any good at all. The graduating engineer now has the further big question of "Where Do I Belong?" running through his mind.*

*We thought that perhaps the CORNELL ENGINEER could partially or wholly answer these questions by publishing a series of articles written by outstanding engineers in their own particular field, describing the post-war aspects and opportunities to young engineers entering into that branch. From time to time articles in this series will appear in subsequent issues. Mr. Nelson's article is the first of these.*

**D**URING recent years the public has become aware of the fact that the petroleum refining industry not only produces gasoline, lubricating oils, and fuel oils, but also large quantities of other materials, some of which were particularly vital to the war effort. Names such as 100 octane aviation fuel, synthetic toluol, butadiene, and synthetic "rubber" which were generally only known to those technically trained, became common names in newsprint and conversation. Although these materials are only a few of the many products derived from petroleum, their names are significant. They disclose some of the present and future trends of developments which will reflect in continued growth and diversity of fields of the

petroleum refining industry. These developments are destined to challenge the ingenuity of all types of engineers.

The twenty-fold increase in the production of 100 octane aviation fuel brought about by the war represents a major step toward the production of "tailor-made" or synthetic fuels. Prior to this expansion, aviation gasoline consisted essentially of a 50-50 mixture of a light virgin naphtha distilled from selected crude oils plus a high quality blending agent, such as alkylate or isooctane, to which isopentane was added for volatility and tetraethyl lead to improve octane quality. With the tremendous demand for aviation gasoline, the refiner was faced with the problem of increasing the availability of suitable light hydrocarbons for alkylate feed stock, and in producing vast quantities of naphtha stocks to supplement the supply of high quality virgin naphthas, that is, the so-called base stock. The end result was an aviation fuel not rated 100 octane but one having maximum power performance characteristics

appreciably exceeding 100 octane quality which consisted of blending together many different "tailor-made" components.

Some of these components were essentially single chemical compounds such as isopentane, iso and neohexanes, isoheptane, and isooctane obtained by superfractionation or catalytic isomerization. Others were specially prepared highly concentrated mixtures of aromatic hydrocarbons obtained by catalytic, pyrolytic, and chemical treatment of virgin and cracked oils. In order to achieve these results new and revolutionary refining techniques were pushed into production, especially through the application of catalytic chemistry. Catalysis was applied for cracking, aromatization, isomerization, polymerization, alkylation, and hydrogenation.

The majority of these processes are now in use producing high quality "tailor-made" motor gasolines. In cooperation with the automobile engine designers the octane quality is expected to continue to increase yielding the benefits of greater engine economy and per-

## THE AUTHOR

The author entered Cornell in 1934, received the degree of B.Chem. in 1938, and was graduated with the degree of Ch.E. in 1939. He was elected to membership in Tau Beta Pi and Phi Kappa Phi. Since graduating he has been employed by the Standard Oil Development Company of Elizabeth, New Jersey, and has been primarily engaged in chemical engineering design studies on refining processes involving the application of catalytic chemistry. He is a member of the A.I.Ch.E. and is Recording Secretary of the Cornell Society of Engineers.



Mr. Nelson

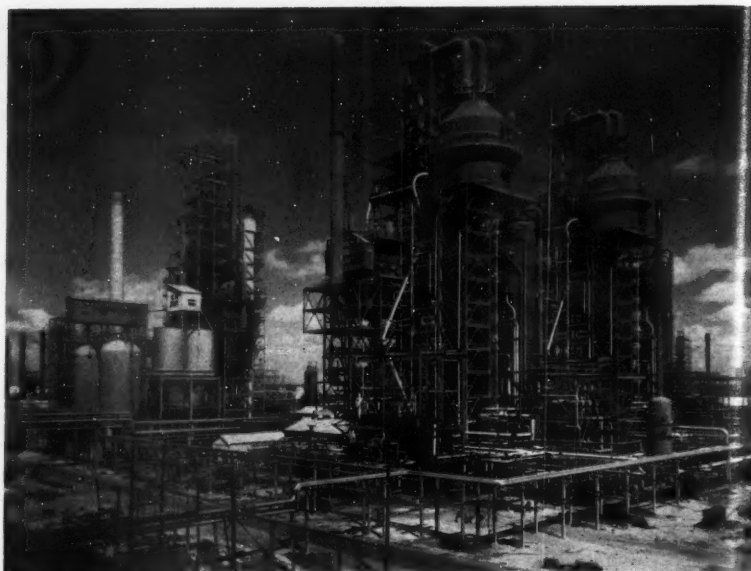
formance. Such increases in gasoline quality will demand further application of the "tailor-made" principle of gasoline production.

### Crude Oil Reserves and Resources

The above discussion is based on the continuance of adequate crude oil supplies. Ever since the first well for petroleum was drilled by Drake in Pennsylvania in 1859, the industry has been plagued with predictions to the effect that our domestic crude supplies would end in a matter of a few years. In spite of these predictions some 30 billion barrels of crude oil have been withdrawn from wells in the United States, and at present, the proved reserve is essentially 20 billion barrels, the highest proved reserve in the history of the industry. Furthermore, estimates by Wallace E. Pratt, retired vice-president and director of the Standard Oil Company (N. J.) and one of the world's outstanding economic geologists, indicate that the world-wide resources of crude oil may be around 600 billion barrels of which 100 billion might be located in the United States.

Even with plenty of oil in sight and with plenty more to be discovered, the research arms of the petroleum refining industry are developing new processes for the recovery of oils from oil bearing shales and sands, as well as the synthesis of liquid hydrocarbons from natural gas and from non-petroleum sources such as from coal. In addition, the

Operator inspecting rubber as it comes off the dryer



Three Fluid catalytic cracking plants to increase the yield of motor gasoline from crude oil.

petroleum industry is expanding its investigations into various aspects of the science of physics and is expected to play an important part in the developments involving the use of atomic energy within whatever regulations are set up by Governmental controls.

### Chemicals From Petroleum

The production of organic chemicals from petroleum symbolized at the beginning of this article by reference to synthetic toluene, butadiene, and synthetic "rubber," has become a very promising and significant part of the petroleum refining industry. Although the total volume of such chemicals represents only a fraction of the volume of crude oil refined to gasoline, fuel oils, and lubricating oils, it is reported that during the war the petroleum industry became a larger volume manufacturer of synthetic organic chemicals than the chemical industry itself.

There is good reason for the quantity production of chemicals from petroleum because of the large supplies of cheap cracked (olefin containing) refinery gases available from cracking oils to gasoline. The catalytic cracking processes installed during the war have appreciably increased the quantities of these light olefinic "building blocks." Therefore, it is certain that chemi-

cal operations will be further accelerated.

Prior to the war the major chemicals produced from petroleum were alcohols, glycols, ketones, and esters. In 1945 production of nitration grade toluene exceeded 11,750 barrels daily with butadiene production at about 200,000 short tons yearly. Large quantities of naphthenic acid, cresylic acid, and many specialty chemicals were also produced. Recent developments are launching the petroleum industry into the manufacture of a large variety of plastics and chemicals in which acetylene, ethylene, and propylene will probably be the major components for chemical synthesis.

A measure of the importance of chemical production to the petroleum refining industry can be gained from the increasing number of oil companies who have in recent years entered this field either alone or in combination with established chemical companies. For many years the Standard Oil Company (N. J.) and the Shell Oil Company each have operated wholly owned subsidiaries handling their respective chemical businesses. The Standard Oil Company of California has recently activated a new subsidiary for their chemical operations named the Oronite Chemical Company. In addition, the Hycar Chemical Com-

pany is owned jointly by Phillips Petroleum and B. F. Goodrich, and the Jefferson Chemical Company has been recently established by the Texas and American Cyanamid Companies. It is also reported that the Standard Oil Company (Indiana) is entering the chemical field. Although it is certain that the production of better fuels and lubricants will continue to be the major interest of refining, the production of chemicals will be tremendously important and profitable.

### Engineers In Petroleum Refining

Having outlined some of the future trends of developments of the petroleum refining industry, an attempt will now be made to briefly describe how engineers will contribute to these developments. Perhaps this can best be outlined by following the stages of development of a new process from the research laboratory into commercial application. For example, let us assume that the research laboratory has developed a new plastic made by low temperature polymerization of certain olefins available in cracked refinery gases. This product has been tested in the laboratory, demonstrating that the material possesses certain unique and important properties.

As the first stage of development, the probable commercial applica-

tions and demands for the plastic must be estimated and cost studies must be made. This information is necessary to determine if work on the project should continue. Accordingly, samples of the plastic are sent to the sales department for transmittal to potential customers who evaluate its use and thereby assist in forecasting market demands. At the same time, chemical engineers analyze the available laboratory data and work up a preliminary commercial plant design from which it is possible to develop an approximate cost of manufacture. Assuming that the sales and cost estimates indicate good commercial possibilities for the plastic, work can then go forward on the second or pilot plant stage of development.

During the preliminary process design, it may become apparent that insufficient engineering information is available on certain phases of the process. In addition, the preliminary laboratory experiments may have been batch operations whereas in the proposed commercial plant continuous flow was planned and it was necessary to assume the use of several special materials of construction. It was indicated, however, that the proposed design would lend itself to pilot plant evaluation to provide answers to these and a multitude of other engineer-

ing and operating questions.

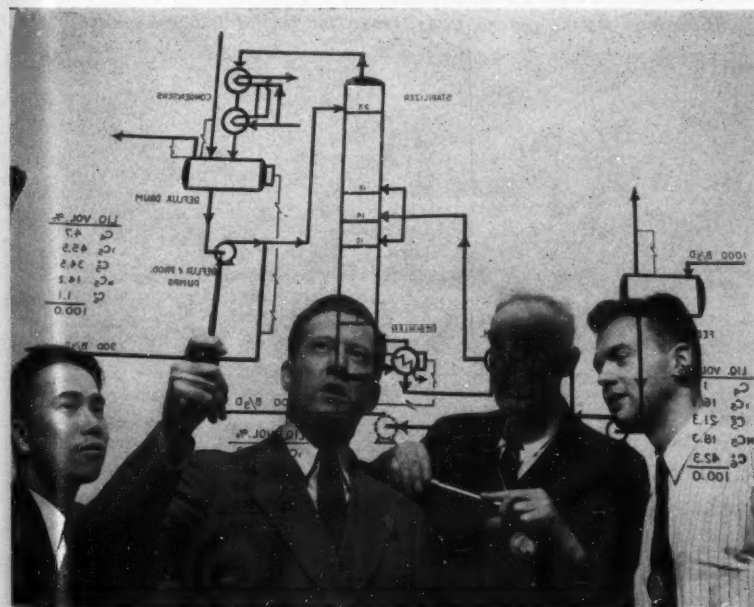
The pilot plant process design, supervision of operations, and process evaluation of data will be conducted by chemical engineers. Mechanical design will be handled by mechanical engineers with the assistance of drafting, electrical, and metallurgical engineers. In addition, specialists such as instrumentation and safety engineers will be consulted. The pilot plant may be designed and operated to investigate all parts of the proposed large scale plant, or it may be necessary only to conduct pilot operations on those sections which are new and unique. Operating programs are drawn up jointly by the design and pilot plant engineers. Normally it is found that several modifications in design features and operating conditions are necessary before arriving at the best process, both from the standpoints of economics and efficient operation.

### Use of Pilot Plant Data

Having gained sufficient information from operation of the pilot plant, the chemical engineers correct the original preliminary process flowsheets and provide the final chemical engineering design. Complete detailed process specifications are drawn up and again the mechanical, electrical, and drafting engineers are brought in to translate these specifications into intricately detailed engineering drawings and engineering specifications. In addition, a definitive estimate of cost of the plant and its operation is secured to check the preliminary economic study. From this stage there follow numerous conferences with special equipment manufacturers, and the securing of competitive bids on this equipment. If refinery construction forces are not employed for erection of the plant, an outside contractor is selected for the job. With the assistance of the key engineers, contracts are drawn up designating responsibility for engineering, construction, erection, cost accounting, fees, schedules to be met, as well as performance guarantees and forfeits. Field engineers are then assigned to follow construction and to serve as liaison officers between the contractor and the re-

(Continued on page 32)

Engineers discuss the proposed chemical engineering design of a project prior to the construction of a pilot plant.



# SULPHUR IN THE MAKING

By KEITH BLANTON, ChemE '48

*All photos courtesy of Texas Gulf Sulphur.*

**T**HE form in which sulfur appeared on the world markets was determined largely by tradition. This was because it was simple and convenient to cast the molten sulfur in a mold and allow it to solidify. Therefore all the sulfur sold in the world before the development of the American sulfur industries was sold in a standardized form. Americans departed from this tradition. Instead of casting their sulfur in the form of ingots, pigs, or cakes, they produce it in an entirely different form. A form was found which was seemingly well adapted to the needs of the sulfur consuming industries.

## Sicilian Sulphur

In Sicily, the main producer of sulfur before American producers started mining it, since sulfur was found in underground deposits and because of the use of hand labor, the sulfur is cast into molds containing one cubic foot of sulfur and weighing about one hundred and twenty pounds. This facilitates the transportation of the sulfur because of the hand labor employed and because of the use of donkeys in transporting it to the railroads and freighters. At sea ports the blocks can easily be carried by men on to the freighters. This unit constitutes a self contained package through use of which handling losses are reduced. Also sulfur cast in this way can easily be separated as to grades. Since 1940 the number of grades of Italian sulfur has been reduced to four known grades. These were best seconds, best thirds, good thirds, and current thirds. This sulfur ranges in purity from 99.5% down to 96.0%. At one time these blocks were used all over the world, but today it is difficult to find an American consumer who remembers using them. Crude "run

of the mine" American sulfur has become more and more common.

In Japan sulfur was also sold in the form of blocks. The sulfur was recovered from ores of volcanic origin and was condensed to a liquid. This molten sulfur was put in cylindrical split molds made out of light iron to solidify. This sulfur is of good quality, being from 99.0 to 99.8% pure. A poorer grade of sulfur known as crater sulfur is also produced in Japan.

The bulk of the sulfur produced in Java is from 98.5 to 99.0% pure and is cast in the forms of bricks weighing two pounds.

Thus it is seen that the sulfur mines of Java, Japan, Sicily, and Italy conformed to tradition and marketed their products in the form of ingots. It might have been suspected that American producers of sulfur would also conform to these traditions, but Herman Frasch, the founder of American sulfur industries, wasn't a miner.

He had been trained in the oil industry. Herman Frasch formulated a process for the mining of sulfur now known as the Frasch hot water process.

## Discovered In U. S.

Sulfur was first found in the U. S. in 1865, when some men drilling for oil in Louisiana came across samples of sulfur. There was good reason for America to become excited. This was a big chance to become independent of the foreign dominance of the sulfur market. There was but one problem. How could the sulfur lying two thousand feet below the surface of the earth be mined? Many experiments were carried on in the mining of sulfur but these only resulted in the death of many men due to suffocation from sulphurous fumes. Then Doctor Frasch became interested in the mining of sulfur. On his first try in 1894 he pumped more than fifty barrels of sulfur before the machin-

This scene shows a train of gondola cars loaded with sulphur being moved to the scales for weighing and on to Galveston for loading into watercraft.

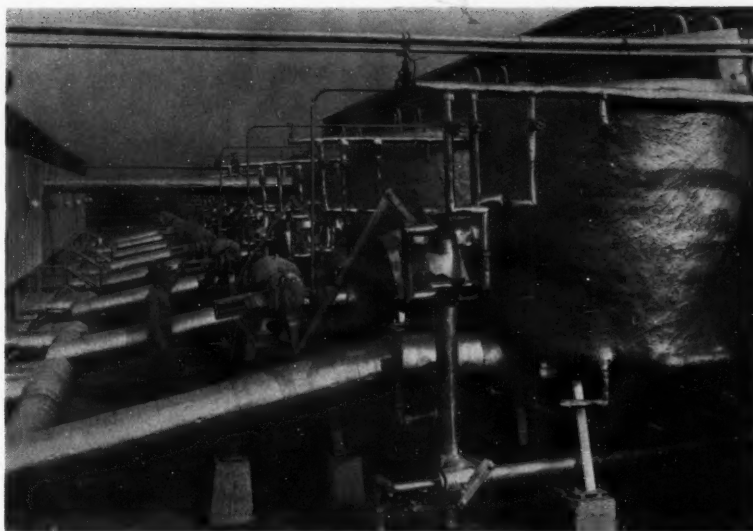
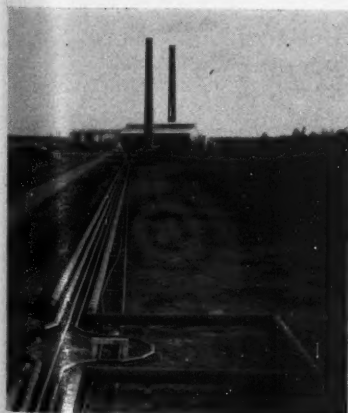


ery broke down. After eight years of ironing out the bugs in his system, he made the Frasch Process a commercial success. He lived to see the Frasch process break the Sicilian monopoly and start America toward independence in the production of brimstone.

The Frasch process consists of melting the sulfur and forcing it to the surface of the earth by compressed air. To do this hot water is directed under pressure through pipes down to the sulfur bearing rocks two thousand feet below the surface of the earth. The sulfur is raised to a temperature above its two hundred and forty degree melting point by the hot water and therefore melts. The sulfur collects in a pool at the bottom of the formation since it is heavier than water. A smaller pipe inside this pipe forces compressed air down into the deposit to force the molten sulfur to the surface. The sulfur is stored in a huge collecting tank at the surface. This collecting tank is a shallow bin which may be very large. The side walls are made of sheet metal and are built up higher as more sulfur is put in. One vat can hold as much as five hundred thousand tons of sulfur. When the sulfur is needed the vat is broken down for shipment. To do this holes are drilled in the sulfur, and explosives are put in each hole and detonated. This breaks the sulfur into pieces suitable for loading and shipping. This sulfur is known the world over as crude "run of the mine" American sulfur.

Sulfur is mined by this process in Texas and Louisiana mainly by

Main pipe lines from the power house to the field. The loops in the foreground are to take care of expansion.



The sulphur production from each well is carefully measured by means of specially designed metering tanks, each holding ten tons.

The Freeport Sulfur Company and The Texas Gulf Sulfur company. The sulfur mines provide another difficulty to mining in that they are temperamental. The temperature of the water must be one certain value which is characteristic of the particular well being exploited. This is because sulfur which is as liquid as water at 315 degrees Fahrenheit becomes as thick as molasses at 330 degrees Fahrenheit.

#### Purity

Crude "run of the mine" American sulfur ranges in purity from 99.5% to 99.9%. It is free from arsenic, tellurium, and selenium. It may contain small quantities of ash, moisture, and sulfuric acid. Since the sulfur is mined in regions where oil is found, crude "run of the mine" American sulfur may also contain small quantities of oil.

Sulfur is a non-metallic element. It is a bright yellow, brittle, dry, and free flowing material. This sulfur is broken up and shipped to the consumer in small lumps which can be more easily used than the molded form. Sulfur is shipped in standard carload lots containing fifty tons of sulfur. Barge loads of sulfur range in weight from 200 to 2,000 tons.

Since Sicilian sulfur is relatively impure compared to American standards, it is refined by distillation, or sublimation, to produce the chemically pure product. The process of subliming sulfur is simple

and consists of charging it to cast iron retorts. These retorts are heated and the sulfur vapors are led into large chambers where the sulfur is condensed. The temperature at which the sulfur condenses determines the type of product obtained. The sulfur that is collected in liquid form is cast into cylindrical molds two inches in diameter. This type of sulfur is known as roll stick or cannon sulfur. Molten sulfur which is allowed to solidify in barrels is called "virgin rock brimstone." This product when broken up into clumps one to six inches in diameter and packed in two hundred pound lot bags or five hundred pound barrel lots is known as "broken rock brimstone." These sublimed products are used for fumigating, preserving, curing, and bleaching where the burning of sulfur is on a minor scale.

#### Flowers of Sulphur

If the temperature of the condensing chamber is properly adjusted, part of the sulfur vapors condense in the form of a very fine powder. This type of sulfur is known as "flowers of Sulfur." This product weighs thirty pounds per cubic foot and is so fine that ninety per cent of it will pass through a hundred mesh sieve. It is therefore used as an insecticide and fungicide for the grape crops throughout the world. Flowers of Sulfur contain

(Continued on page 30)

# Engineering At Cornell

## II. Architectural Design Laboratory

By MARY ELIZABETH ALLEN, Arch '46

UPON investigation, the rays of fluorescent lighting fanning upward from the dormers and skylights of White Hall and the strains of symphony or jazz (or both), sometimes interspersed by voices and laughter, would lead one up three flights of stairs to the drafting rooms which cover the top floor of the College of Architecture. Under the pipes and skylights of the center drafting room, the drafting tables line the walls in booths and form a row through the middle. Four men and/or women can work in each booth or set of tables. All the upper classmen are accommodated in this room at present, with the freshmen and graduate students in the north and south drafting rooms respectively. The activity in this lab is a truer expression of the spirit of an entire college than can be found in any other college of the University. Approximately, 80 people spend an average of 6 hours a day together here. Whether working or relaxing, it is inevitable that a feeling of cohesiveness should develop which carries beyond the immediate confines of the drafting room itself. It is with honest pride that an architect introduces his friends to this place about which his college life centers, whether he is a freshman who has not yet grasped the significance of his new and colorful environment, or a senior of whom it has become an inherent part to be carried with him after graduation.

But there is a course taught there and it has several numbers—the

fate of all instruments of university teaching. Architectural Design is a required part of the students curriculum from the time he enters the College of Architecture to the time he completes his thesis for graduation. The freshmen, confronted with Design 110, may find the prospects discouraging when told that his first few weeks will be spent on a composition in paper. The next project involves planes presented in a stiffer material. That about completes the ordeal with "paper dolls" and whether he has acquired a sense of composition in this time or not, he is ready, willing and eager to tackle a more tangible problem.

During the next few years his

problems will vary from the simplest open air market or small residence to a theatre or hotel. A sequence of calculus, mechanics and structural design run parallel to this training in Architectural Design so that eventually the student can coordinate the two essential elements of building design.

The procedure for each program follows approximately the same pattern. The problem is issued on mimeographed copies of the requirements. On the first day the professor, who wrote the program, may call the class together to discuss it informally and give some leading suggestions. From then on

(Continued on page 22)

Students at work in the drafting room on the third floor of White Hall. Here, in a convivial atmosphere, the students spend much of their time, sometimes working far into the night.

—Drutch



## Techni-Briefs

### Big Breeze

TIME was when tests flights were the crucial moment in the aviation industry. Today an equally colorful and more scientific system has been developed. Besides being photogenic, wind tunnels are an important contribution to the full-fledged aviation industry. Considerable engineering imagination went into the development of these giant tunnels. The task was to simulate actual-flying conditions. In a huge roofless rectangular building, each of whose sides is a cylinder, large propellers circulate air at varying speeds. At the corners of the tunnel, the air is smoothly directed by a set of curved vanes. As one approaches the section where the test is being conducted, the diameter is quickly reduced to a small cylinder in which the model plane is supported. Here the stresses on all parts of the plane's structure can be simultaneously recorded.

Prior to the war, tunnels were too small and measurement in them had not been developed to the point where the test could be depended upon for accurate results.

During the war many improvements on the earlier wind tunnels were made. One of the new wind tunnels was set up at Moffet Field near San Francisco. Wind speed in the tunnel is approximately 600 mph and requires two 13,500 hp motors operating in synchronism over a speed range of 50 to 300 rpm.

One difficulty to be overcome was that few power systems can stand such a large motor put on them except at a slow rate, even when started without load. Engineers solved this problem in such a way that the largest motor started directly from the utilities lines was only one seventh the size of the wind propeller motor. Once this motor was started a small dial switch about the size of a radio dial made pro-

pellor speed available at any desired rate.

Another triumph was the design of variable frequency drives for the propeller motors of the model plane. The test of the model plane would not give accurate results if the propellers of the model ran at the same speed as those on the large plane, so this drive compensates for the difference. Thus the difficulties of large scale wind tunnels were overcome.

### New Fluorescent Lamp

Revolutionary developments in fluorescent lighting, making possible a brighter yet more mellow light, instant illumination and double lamp life are combined for the first time in Safreen, a new fluorescent lamp.

Timed to meet the urgent needs of the reconversion period, this vastly improved fluorescent lamp will be produced during initial stage only for commercial and industrial users.

When not illuminated, the new light appears little different than any other fluorescent lamp, but, turned on, it is perceptibly brighter and its safreen glow—a skillful blending of saffron with a touch of green—is as new and distinctive as it is restful to the eyes. Laboratory tests have demonstrated that a 40-watt Safreen produces 20 per cent

more light than the standard 40-watt white fluorescent and is approximately 40 per cent brighter than the standard 40-watt daylight lamp.

Even more important to the large user of fluorescent lighting is the fact that the new fluorescent lamp will provide instant illumination with the flick of the switch. There is absolutely no delay and no annoying flickering. No starters are required with this new lamp.

### Swallow Counter

A miniature short wave set that detects and broadcasts minute changes in pressure on the human eardrum has been developed by a Westinghouse research engineer as a means of testing the adaptability of pilots for high altitude flying.

Clamped to the head of the flier like a pair of over-sized earphones, the tiny broadcasting unit sends out a signal each time the flier swallows. The number of swallows, which indicates his ability to compensate for changes in altitude, are recorded on a chart outside the chamber and plotted against variations in altitude.

Inside each of the transmitter earphones is a fluid filled chamber through which pressure is transmitted from the flier's eardrum on

one side to the diaphragm on the other. When the flier swallows, the liquid presses against the diaphragm, causing it to move a tiny pin within the instrument. This transmits a signal to the chart outside the chamber, where the compensation appears as a peak in an otherwise smooth curve.

Devised to meet a war-time need, the peacetime uses of this electronic device remain unexplored. One distinct possibility, however, is its use as a tool in the study of hearing defects.

Test area in new Moffet field wind tunnel





Oscar

—Reese

### Oscar Fuller, CE

YOU'VE undoubtedly heard many stories of the farmer's daughter and what she did, but the activities of a rural family's son are usually not so well known. However, Oscar Fuller is an exception to the rule. He grew up on a farm, but his activities here at Cornell are known to all.

His scholastic abilities were very evident in high school. He graduated with honors from Mills High School in Louisburg, North Carolina. Then he entered Louisburg Junior College in September of 1942. It was here that he first got his nose into politics. He became president of the Men's Student Council and was elected to head the Phi Theta Kappa society, a National Honorary Society for Junior Colleges. As if this were not enough to keep him busy in his freshman year, he took over as editor of the year book.

He started off his second year just as he ended his first—with a roar of activity. This roar was choked about halfway through the term, however, when he received his "greetings" from the draft board. After going through boot training at Bainbridge, Md., Oscar was assigned to Quartermaster school. Before he got started there, though, he applied for V-12 and was accepted.

In loyalty to his native South, Oscar requested Duke or Georgia Tech on his V-12 application, but the Navy bigwigs saw things differently and Oscar was assigned to Cornell. He has no regrets about being sent here, however, in fact, he

# PROMINENT

thinks Cornell is tops in every respect.

Oscar is President of the Cornell Chapters of both Chi Epsilon, a National Honorary Scholastic Society, and the A. S. C. E. He is a member of Tau Beta Pi, Pi Beta Tau, and the Rod and Bob Club. Also, on Saturday afternoons he dons a Big Red Band uniform and wrestles with that biggest instrument of them all, the tuba.

A firm believer in the Honor system, he was recently elected Chairman of the C.E. Honor Committee. On this subject, Oscar remarked, "I think it (the Honor system) is the best system that I have ever seen used in any school. I know it isn't one hundred per cent successful, but I would like to see the other schools on the campus adopt it. I think the results have been well worth our efforts in the C.E. School."

### Don Beaumariage, EE

"BEAU—AH—BEW," Beaumariage, a man in the rear ranks yells as he comes forward to make his presence known to the stumbling lieutenant, "Dould Curtis Beaumariage, sir." Thus began Don's "naval" career at Cornell, while waiting in the maze of lines in Barton Hall. He had just arrived in Ithaca with the first carload of bewildered men from down Pittsburgh way on the eventful day of 1 July 1943. Soon becoming used to the difficulty people seemed to have in pronouncing his name, Don reconciled himself to the name "Beau."

Don was born in Bridgeville, Pennsylvania on 12 August, 1925. He went to Bridgeville High School where he was awarded the Rensselaer Science Award, and received a scholarship to Carnegie Tech. After six weeks in chemical engineering there, the Navy stepped in and Don found himself at Cornell. He became one of Pappa Gross's boys in the E.E. school and "hasn't regretted it since."

His first quarters (there proved to be many later) were destined to

be his fraternity house for he joined Alpha Tau Omega in his fifth term. Don became president in his seventh term and when the Navy vacated, he helped reopen the house with his two other fraternity brother roommates.

In his junior year "Beau" was invited to join Eta Kappa Nu, honorary electric engineering society, and is now treasurer. He joined Tau Beta Pi at the start of the senior year.

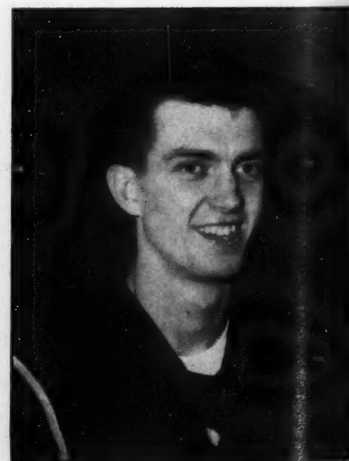
Since winter was coming and he didn't know whether he would be warm enough in Navy attire, "Beau" aspired to obtain a "Big Red" blanket to insure his comfort. He was completely successful by obtaining a varsity letter in soccer in the fall of '45.

Don likes E.E., but doesn't want to spend all his life just being an "electron pusher." After getting out of the Navy, if not overcome by the freedom, he would like to obtain some practical engineering experience and then maybe return to Cornell to take up chemical engineering.

This February will see Don with a BEE (communications option) degree and if all goes well, an ensign's commission. As to plans for the future they are still a bit hazy. But somewhere along the line he plans a modern type home with all latest conveniences and of course, the rest of a family.

Don

—Deutch



THE CORNELL ENGINEER

# ENGINEERS

## Owen Black, ME

JULY 1ST, 1943 saw a mass of boys loaded on a special train at Hoboken bound for Ithaca and an uncertain future in the newly formed Naval College Training program. Marched up the Hill to the tune of resounding cheers by the assembled townspeople, they viewed the spacious surroundings of the Cornell campus with mixed feelings. Yes, 1600 V-12ers had invaded Cornell. Since that time many have left our ranks. One of the few remaining, Owen J. Black, has compiled a record which requires publication in such a medium as this.

After acclimating himself to the rigors of Navy life, Owen spent the bulk of his spare time studying and compiling one of the highest averages in his school. Classification of trainees occurred at the end of his second term and it was our fortune as well as Owen's that his orders read "to continue training at Cornell as Aeronautical Engineer."

Continuing his residence at Dorm 19, the Delta Phi house, Owen maintained his high average as well as participating in Cornell athletics. It was then that Owen made valuable friendships with several boys from Sigma Nu. Owen soon was a member of that fraternity.

It was then the summer of 1944 and Owen had undergone the

change of heart so similar to many other V-12's stationed here. From an attitude of indifference toward campus life, he found himself deeply attached to Cornell. But Owen was determined to do something for his school.

After one unsuccessful attempt, Owen was elected to the Student Council for the past summer as senior representative. He also acted in the capacity of treasurer. When the clamor for a dance arose, Owen, acting as chairman of the dance, engineered a great success while operating under severe conditions. Owen is also a member of ASME, Atmos, Tau Beta Pi, and has been social chairman of Sigma Nu for the past year.

This then is the story of an engineer who made the most of a marvelous opportunity, a four year education in a great school with a subsequent commission in the Navy.

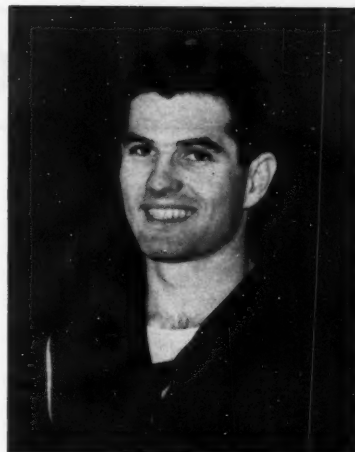
## Mac Adams, ME

MAC ADAMS is one of those few people fortunate to have a nickname for a first name. Mac is Mac, and everyone knows who Mac is.

Mac has been in the Navy since July 1943, first in the V-12 at the University of Virginia. In March 1944, he was transferred to Cornell. These two universities coupled with two high schools have made Mac's education broad and extensive.

Mac has lived in three different towns in Virginia. He spent his early days in Gretna, Virginia, in a "small country home." Later the Adams' moved to Danville and, in the last part of 1941, to Portsmouth, Virginia. Mac went to George Washington H. S. in Danville for two years and to Woodrow Wilson H. S. in Portsmouth, the other two. In high school he was quite an athlete, playing four years of football and four years of tennis. During the summers, he went to camp, becoming a counselor after two years.

When he entered the V-12, Mac was asked what course he would



Mac

—Deutsch

like to take. "I requested civil engineering; the Navy gave me mechanical, but I'm satisfied. I just hope they knew what they were doing." At Cornell, Mac is a member of Atmos, honorary Mechanical Engineering society, and Tau Beta Pi, and is corresponding secretary of the latter.

Mac's hobbies are varied and many. His stamp collection used to get most of his attention though he hasn't had much time to do anything with it for several years. Back in Virginia, hunting, fishing, and boating attracted him. "Boating on the Chesapeake was great," says Mac, "probably because I used the other people's boats more than my own." Out in the bay, he used to watch British, French, American, and ships of other nations come into Norfolk Navy Yard.

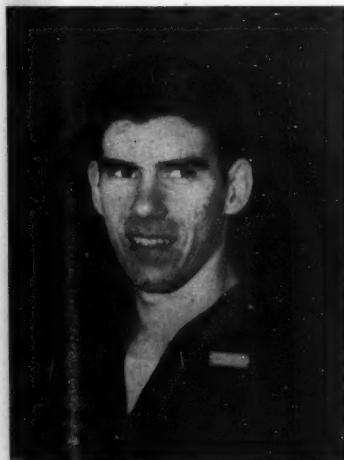
Mac plans to graduate from Cornell in February with a B.S. in M.E. He hopes to be out of the Navy by September—"I've been going to school steadily since September 1942, and that's long enough for me." Mac would like to get in some sort of aircraft or automotive work after becoming a civilian. Any part of the country would suit him for his job. Mac says the people of the North and South are not as different in views as public opinion takes them to be.

Mac's disapproval of the accelerated program is shared by many. As he says, it saturates the mind and decreases one's efficiency. Mac is a firm believer in the faith that too much studying makes one stale.

(Continued on page 28)

Owen

—Deutsch



# NEWS OF THE COLLEGE

## New Scholarships

ESTABLISHMENT of 100 new scholarships at Cornell University, each with an annual stipend of \$600 plus free tuition, was announced by President Edmund E. Day.

To be known as Cornell National Scholarships, the awards will be made to as many as twenty-five entering students each academic year, beginning next fall.

The scholarships will be awarded to men and women entering Cornell directly from a secondary school, and may be held in any undergraduate division of the university for the period normally required to receive a bachelor's degree, provided the holder maintains a satisfactory standard of performance.

Applications will be received by the committee on National Scholarships, 209 Morrill Hall, Ithaca, up to March 1 of each year from candidates who will have completed entrance requirements by the following July 1, and who have already applied for admission to Cornell. Engineering candidates, except New York state residents attending schools within the state, should apply for the McMullen regional scholarships in engineering. Awards of the National Scholarships to students in engineering from outside New York state will be made among candidates for McMullen awards.

Although the university board of trustees has guaranteed funds to initiate the new scholarships, it is expected that the scholarships will be supported eventually by gifts to the Cornell alumni fund, and through special gifts from individuals to establish scholarships as memorials to former students and others.

First individual gift in support of the National Scholarship program is a \$26,400 memorial scholarship fund from Eugene Meyer, editor and publisher of the Washington, D. C., Post, in memory of his brother, Edgar Joseph Meyer, a Cornell graduate, who was lost in the sinking of the Titanic.

## Navy Leaving

WITH the graduation of the last class of midshipmen at the Cornell Midshipmen's School December 7th in Bailey Hall, came to a close the entire V-7 training program in the country.

Since 1940, approximately 70,000 men have been commissioned ensigns in the U. S. following the four months of midshipmen training. Nearly 3500 of these were commissioned at Cornell.

Some of the officers attached to the school are being retained to serve as instructors in the Naval Reserve Officers Training Corps, and a large part of the administrative staff is being retained to administer the NROTC, V-5, and V-12 programs.

Navy Diesel School at Cornell also closed after operating since March, 1941. This was the original Naval training school on the campus. Approximately 2100 officers received training in Diesel Engineering in the 57 months the school operated.

Space in the men's dormitories being vacated by the graduating midshipmen will be filled by V-12 students who will move from outlying houses, some University-owned, some privately-owned.

Dr. T. R. Cuykendall, recently promoted to associate professor of engineering physics, has been on leave since 1941 to carry on research at the Naval Ordnance Laboratory and on the Manhattan Project.

## A.S.M.E.

The A.S.M.E. held a meeting Friday, December 14, at which Lt. Comdr. Carpenter spoke on "Celestial Navigation." Comdr. Carpenter was head of the astronomy department at the University of Arizona, and is now with the Naval Training School at Cornell.

The society plans to continue the speech contests. Other plans include movies on plastics and jet propulsion.

Louis Conta is the new sponsor. Other new officers are President Al Brady, Vice-Pres. Wilson Breiel, and Secretary-Treasurer Frank Price.

## A.I.E.E.

The Student Branch of the AIEE has had two recent meetings. The first of these was held on November 30th. A film entitled "Exploring with X-rays," supplied by the General Electric Co., was shown to the group. Upon the conclusion of the formal part of the meeting, the group adjourned to the basement of Franklin where refreshments were enjoyed by all.

The second meeting was held on December 14th in the Cornell High Voltage Research Laboratory. Prof. S. W. Zimmerman, Prof. N. M. Peterson, and Mr. Francis Chaw conducted a very intriguing demonstration on high voltage and its effects. The effects of a 3,000,000 volt man-made lightning bolt on insulators and various protective devices were demonstrated. Mr. Chaw "risked his life" in the interests of science by consenting to undergo a supreme test of the fundamental physics principle, that of the Faraday cage. He climbed into a makeshift cage and allowed a 3,000,000 volt stroke to be discharged through the cage while he remained inside. Although highly reassured as to the soundness of their physics books, none of the spectators present were willing to accept Prof. Zimmerman's invitation to "try it yourself."

The Branch is planning an extensive membership drive after the Christmas vacation. In as much as a large portion of the Branch's active members, at present, are in the Navy V-12 program and expect to leave or graduate at the end of the term, it is hoped that a large response from civilian students in the lower terms will be received during this drive. An effort will be made to contact every student en-

(Continued on page 28)

# ALUMNI NEWS

**MAURICE DU PONT LEE, M.E. '08**, manager of the Rayon Technical Division of the E. I. du Pont de Nemours & Co. since 1932, and a pioneer in the development of Du Pont's interests in dyes and synthetic fibers, has been named general consultant in the Engineering Department.

Mr. Lee was employed by the Du Pont Company shortly after his graduation and worked as an assistant purchasing agent until July of 1910, when he was assigned to the Engineering Department. Prior to World War I and immediately thereafter, Mr. Lee traveled extensively in Europe studying dyes and synthetic fibers. He was in charge of the design and construction of the company's first dye plant at Deepwater Point, N. J.

With the formation in 1920 of the Du Pont Fibersilk Company, forerunner of the present Rayon Department, Mr. Lee became production manager of the first plant at Buffalo, N. Y. Three years later, when the Du Pont Cellophane Company was formed, he was named production manager and secretary. In 1925, when the Fibersilk Co. became the Du Pont Rayon Co., he was made vice-president and secretary of that corporation and the companion Cellophane Co.

**COLONEL WILLIAM C. BLISS, M.E. '17**, is deputy Ordnance officer of the Nagoya Base, Japan, under the Sixth Army. In September, 1944, he was given command of the 72d Ordnance Group of the First Army, and served in Europe for seventeen months. He holds the Croix de Guerre for his part in the liberation of France and the Bronze Star Medal for his work during the Battle of the Bulge.

**LIEUTENANT WILLIAM A. TYDEMAN, JR., M.E. '31**, has been released from the Navy after forty-four months of service, twenty-four of them overseas. As maintenance officer, he supervised the work of decommissioning his ship, the *J.*

*William Ditter*, a mine destroyer which was badly damaged in an attack by Japanese kamikaze planes off Okinawa on June 6. He is now associated with the architectural firm of Evans, Moore & Woodbridge, New York City.

**LIEUTENANT (JG) DAVID K. SERBY, C.E. '38**, has been in the Southwest Pacific for two years. He has been with the 105th Naval Construction Battalion in New Guinea, Leyte, and is now in the Philippines. His brother, William B. Serby, C.E. '38, is also a lieutenant (jg) with the Seabees, and is now located on Guam.

**MAJOR NOAH E. DORIS, M.E. '39**, a paratrooper, entered Tokyo with the 11th Airborne Division, the first American troops to occupy the city. With the Division since its activation in February, 1943, he fought with it in New Guinea and the Philippines, and was among the paratroops who jumped on Tagatay Ridge, Luzon, in the drive on Nichols Airfield.

**LIEUTENANT HENRY E. OTTO, JR., B.S. in A.E. (M.E.) '42**, writes from Linz, Austria:

"The other night I was half listening to a radio program which featured mementos and radio visits to various towns in the United States—San Francisco, Hartford, Norfolk, and then Ithaca with the chimes playing the Alma Mater. This was followed by a description of the town and a newsboy's call as he advertised that the "Ithaca Journal" had just come off the press. It gave me a case of nostalgia for the campus for a while."

**R. KING STONE, M.E. '15**, after four and one-half years with the Hercules Powder Company, assisting in the war effort manufacturing explosives, has been appointed Sales Engineer with the Ross-Meehan Foundries, Chattanooga, Tennessee. Mr. Stone has had a great many years experience in the steel and iron industry with such concerns

as the Bethlehem Steel and Bethlehem Shipbuilding Corporations. He will be placed in charge of the North and South Carolina Sales Division servicing various types of steel and "Meehanite Metal" castings applications.

**WILLIAM F. Beeker, Jr., son of W. F. Beeker of 2523 Ransdell Ave., Louisville, Ky.,** has been promoted to Captain at this advanced Army Air base.

Assigned to the 316th Bombardment Wing VH, which is the B-29 (Super-Fortress) unit of the famed Eighth Air Force, Captain Beeker at present is in charge of communications for the Wing and its many subordinate units.

After completing Louisville Male High School, in 1929, Captain Beeker studied civil engineering for one year at Vanderbilt, Nashville, Tenn., and then went to Cornell University, where he majored in Mechanical Engineering, earning his degree in 1934.

Captain Beeker has been on Okinawa since September, after having left the United States in July.

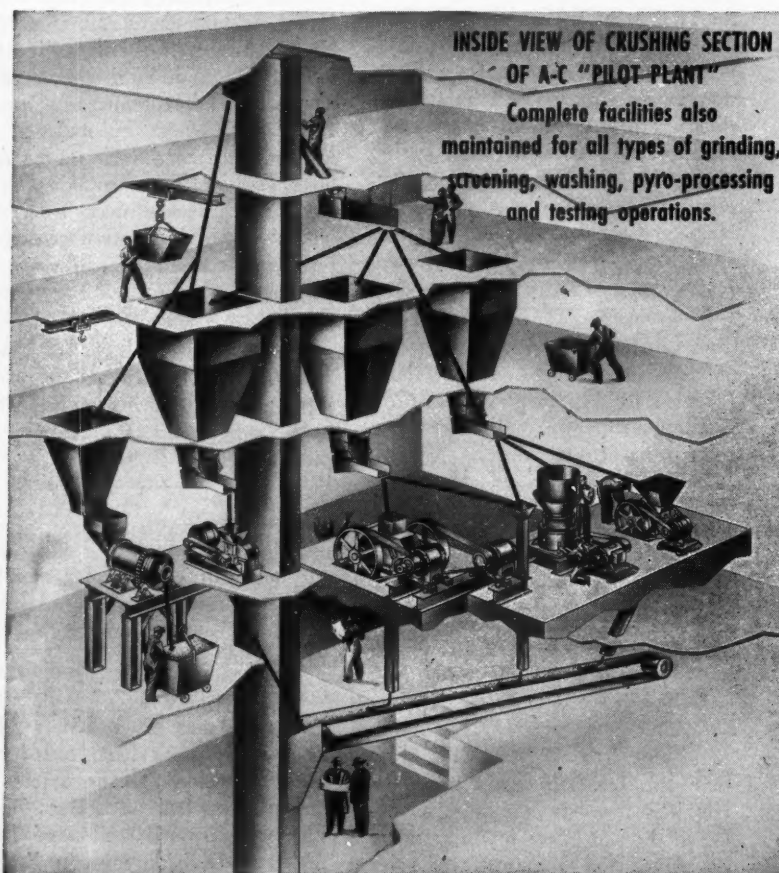
**EDWIN G. Speyer, C.E. '07**, since 1920 in private practice as a designing and consulting engineer, has been appointed commissioner of public works of Buffalo.

**J. Carlton Ward, Jr., M.E. '14**, president of Fairchild Engine and Airplane Corporation, is a member of the National Planning Association's advisory committee on the aircraft industry.

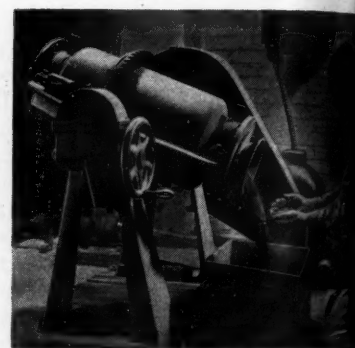
**MAJOR James M. Robinett AUS, Chem.E. '41**, has been transferred from Division Headquarters to executive officer of 321st Glider Field Artillery Battalion of 101st Airborne Division now in France. He holds the Bronze Star Medal for "heroic and meritorious service" during Normandy invasion, and an Oak Leaf Cluster for meritorious service since D-Day.

# "TEST TUBE" FOUR STORIES HIGH!

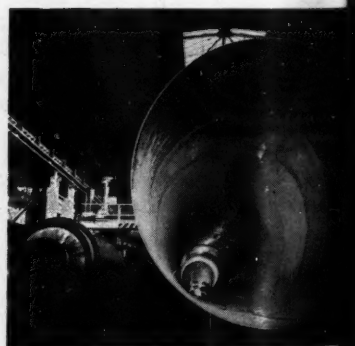
**NEW BASIC INDUSTRIES LAB TYPICAL EXAMPLE OF HOW A-C  
COOPERATIVE ENGINEERING WORKS TO AID ALL INDUSTRY!**



**1** "How can we make more accurate equipment recommendations to meet specific process problems?" was the question A-C asked its own engineers. Their answer: build a laboratory so complete in every detail that it can simulate actual mill conditions no matter what the locality or basic material involved. Today, that laboratory is ready for use at A-C (crushing section above)—one of the most extensive ever built to serve the basic industries!



**2** Inside this "pilot plant," sample non-metallic minerals and synthetics can be "batch-tested" by the pound, processed in ton or carload lots. Engineers and their engineers can select the equipment to suit specific needs.



**3** From the smallest vibrating screens to the largest kiln (above), A-C builds the most complete line of crushing and milling equipment in the world. We're ready to help you solve your technical problems.

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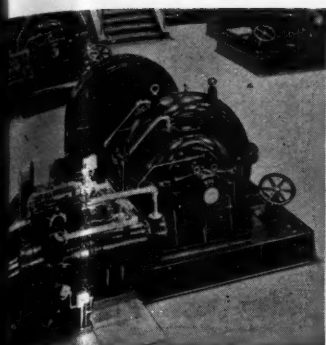
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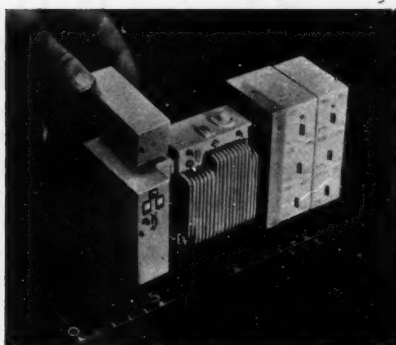
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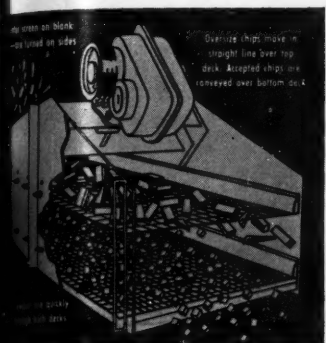
Look, for instance, what A-C engineering has done in water distribution. Today, one A-C Centrifugal Pump does the job of 3 old-type pumping engines 10 times its size—does it better . . . more economically!



**5** In fact, an A-C Centrifugal Pump can deliver 75 million gallons of water a day—enough to meet the average needs of a city of 500,000. Cost to consumer? . . . as low as one cent for every 100 gallons delivered!



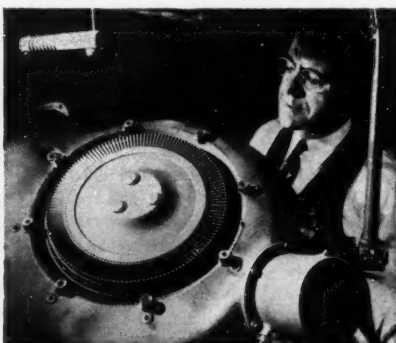
**6** To facilitate modernization of unit substations, A-C introduced this innovation: visual planning with accurate scale models of equipment that reduce paper work—save hours of complicated figuring!



For the pulp and paper industry, still other outstanding developments: the Low-Head Chip Screen (above), a new Streambarker for barking logs, a wide variety of grinders, digesters, thickeners, blow tanks.



**8** Today, A-C engineered products are helping boost production of vital U. S. paper and cardboard—represent just one section of the world's largest line of major industrial equipment!



**9** War-proved products and techniques — practical experience with technical problems . . . that's what this Company can offer you. For complete details inquire at your nearby Allis-Chalmers office!

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# Cornell Society of Engineers

107 EAST 48TH STREET

1945-1946

NEW YORK 17, N. Y.

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*"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."*



Mr. Leinroth

## President's Message

PERHAPS the most enduring of all memorials are university endowments for professorships and scholarships. The need for them is never satisfied in great universities. For good students and great teachers constitute the heart of a great university and such institutions must attract and hold them if they are to continue to be great.

Cornell is unusually fortunate in having been the recipient of the McMullen Fund which has made it possible for the College of Engineering to attract outstanding students many of whom would undoubtedly have gone elsewhere. It is difficult to estimate the value of this fund to the College, to the University and to the Nation. It behooves the Alumni to be well informed regarding it.

John McMullen, strangely enough, was unknown to most Cornellians and in Ithaca. He had virtually no formal education nor engineering training but had outstanding ability as a leader and organizer of men. He was born in Connecticut of Irish parents and early in life he became a journeyman carpenter. Migrating to California he became associated with Hermann Krusi '82, probably his closest connection with Cornell. These two formed the San Francisco Bridge Company; later they, with George Catt, organized the Atlantic & Pacific Company.

In spite of his lack of formal education his views on it were those of an aristocrat—he believed in educating only those of exceptional ability and providing the means for so doing. It was with this in mind that when he died in 1921, he bequeathed the income from his stock in the Atlantic Gulf and Pacific Company to Cornell. This income has increased greatly since 1921 affording more and better scholarships to well qualified boys—both undergraduates and graduates.

There are four types of scholarships which are supported by the McMullen Fund at the present time. There are the Regional Scholarships, the Undergraduate Scholarships, the Graduate Scholarships and the Industrial Scholarships.

The Regional Scholarships are awarded to students outside the State of New York or to those who are not eligible for New York State Scholarships. An allotment of scholarships is made to each of the fifteen regions into which the country is divided. The awards are made with emphasis on scholarship but with other traits and records which would indicate success in the engineering profession taken into account. At the present time 130 of these Regional Scholarships with a stipend of \$200 per

term are authorized in addition to 120 scholarships with a stipend of \$50 per term. The selections are made after the records are reviewed by the Scholarship Committee at Cornell and the likely candidates are interviewed by Alumni Committees. Retention of the scholarship is predicated upon maintaining an average of 80 or standing in the top quarter of the class each term.

The Undergraduate Scholarships are awarded mainly on the basis of financial need. Any student who has completed at least two terms of residence at Cornell and is having difficulty maintaining himself financially may apply. At present 80 of these scholarships at an average rate of \$100 per term have been authorized. Students receiving these scholarships must maintain themselves in good standing to retain the scholarship.

The Industrial Scholarships are awarded to those having completed an apprenticeship training program in industry or having had other satisfactory industrial experience. Sixteen such scholarships are authorized—four per year—carrying with them a stipend of \$200 per term. The student must maintain an average of 80 or be in the upper quarter of his class to continue to hold this scholarship.

Graduate Scholarships at the rate of \$450 per term are offered to encourage advanced study. Normally 15 of these are awarded.

Through such a generous endowment John McMullen has made it possible for us to attract outstanding boys to Cornell who in turn will bring credit and prestige to the University and to the College of Engineering. To alumni this fund presents at once a challenge and a responsibility. It is our job as alumni of the College of Engineering to see that the best possible use is made of these scholarships. A relatively small number of alumni are active as members of Alumni Committees; a large number can and should be active in bringing the scholarships to the attention of outstanding boys and to the head masters and principals of the secondary schools in their localities.

The McMullen Fund is filling a long felt need for scholarships. There is an equally long felt need for endowments for professorships and it is hoped that such endowments will not be long in coming in generous amounts. They loom as most important in the plans for the future of the College of Engineering and alumni can also be most useful in helping to bring such endowments to the College.

—J. PAUL LEINROTH

# Newsworthy Notes for Engineers



## We're fussy about our Spaghetti!

In the language of vacuum tube makers, "Spaghetti" is a ceramic sleeve for insulating conductors. As the emphasis in electronics has moved toward higher and higher frequencies, tube elements have grown smaller and smaller till some "spaghetti" insulators are the size of a bristle in your tooth-brush!

The smallest ceramic sleeve now made by Western Electric measures under .030 of an inch outside diameter, with a center hole of .020 inch. This means the walls of the tube are only .005 inch thick—yet each unit is rigid, strong and provides good insulation.

In the production of hundreds of varieties of such tiny elements, Western Electric engineers have achieved remarkable precision which has had much to do with the rapid progress of electronics.

## Rush! Rush!

After V-J Day, orders were to produce telephone central office equipment—*fast!* This program couldn't wait until the last radars were completed. So production engineers went into the moving business.



At one plant location they had to move everything to a new building, with 850,000 sq. ft. of floor space—virtually plan the operating layout of a new factory immediately!

Some of their problems: model floor plan; "write up" showing how many machines—what type—how many people—how many shifts—scheduling and flow of materials and finished parts—power circuits, water, lighting—conveyors and cranes—tools and benches—jigs and fixtures for assembly.

At a single Western Electric Works, 106 manufacturing sections required either complete or partial rearrangement and retooling. In one month, 35 of these sections were reconverted.



## Tiny Crystals can't be Sissies

Delicate quartz crystals—some only one-eighth inch square—withstanding a terrible beating in military radio equipment. One reason: engineers at Bell Laboratories and Western Electric devised a way to anchor them gently, yet firmly, in place—assuring stability and perfect contact between terminal wires and crystal.

Here is how it is done: after the crystal is ground nearly to prescribed frequency, a spot of liquid silver is applied at exact points for terminal wires. Baking at 1000° F fuses the silver to the crystal. Then the entire surface receives a finish of vaporized silver.

Finally—using a precision fixture—the terminal wire, with a dot of solder on its tip, is lined up with the spot of silver and a jet of hot air anchors it firmly in place. During the war, millions of military crystals were assembled in this manner.

*Manufacturing telephone and radio apparatus for the Bell System is Western Electric's primary job. It calls for engineers of many kinds—radio, electrical, mechanical, chemical, metallurgical. Many of the things they do—whether seemingly little or big—contribute greatly to the art of manufacture of communications equipment.*

# Western Electric

☎ ☎ ☎ SOURCE OF SUPPLY FOR THE BELL SYSTEM ☎ ☎ ☎

## Architecture

(Continued from page 12)

til the preliminary sketches are due for seminar criticisms, the student is on his own to do research where he will and consult his critic as he progresses. The preliminary sketches are usually presented on tracing paper and may or may not be graded. The primary purpose is to coordinate the student's ideas thus far so that the critic may redirect him if necessary. It is not unusual to have more than one preliminary before the final drawings are presented—neither is it unusual that all drawings should be scrapped each time. The final presentation must be rendered with various elevations and perspectives.

On the morning after a rendu the "closed" sign drops on the doors of the exhibition room while the jury makes its judgment. And in the afternoon the merits and failings or the problems are discussed in a public criticism by the head critic.

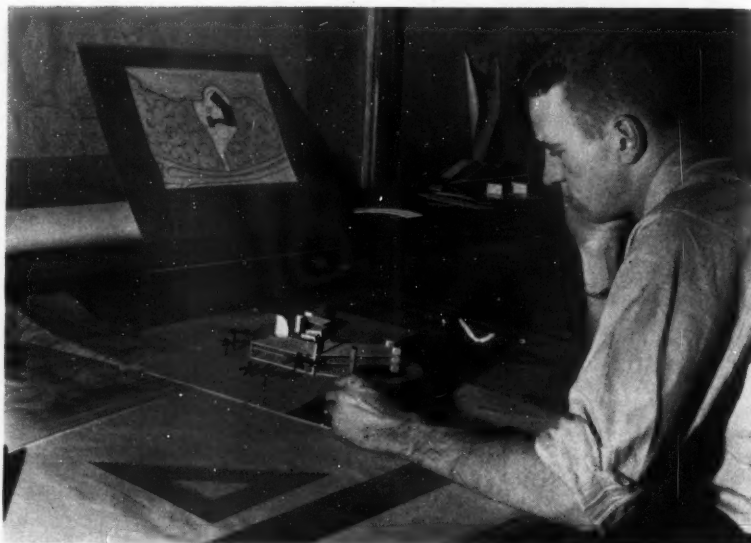
At intervals throughout the term, all upper classmen spend a day beavering on an "esquisse." This consists of a problem issued at 9 A.M. to be designed, rendered, and

presented without research or criticism before closing time that same evening. The sketch problem is a menace to the state of mind but we are told that it is excellent training for the type of problem required in state examinations for license to practice.

The last term of the senior archi-

Architecture student studying a model. This has been found to be one of the best methods of working out problems involving three dimensions.

—Deutch



## Cascadilla School

Est. 1870

A Regents School where aim is to prepare students for University work.

Special attention to students with unusual programs or to whom English is a foreign language.

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Tutoring in university courses that is effective because directed to individual needs.

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14-Ton Ice-Making System



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## Fricks COMMUNITY REFRIGERATION CENTER Serves Over 15,000 Customers

Pat Denham's model plant, covering an entire block at Oklahoma City, provides ten distinct services: it has the world's largest food-locker system, safekeeps 10,000 furs, operates a general freezer storage, makes crystal-clear ice, processes all kinds of foods, does quick-freezing, sells frozen foods, runs a restaurant, has a gas station, and includes a big laundry. Frick refrigerating, ice-making, and air conditioning equipment carries all the cooling loads.

Bulletin 126 tells how any town or city can profit from a similar COMMUNITY REFRIGERATION CENTER. Write for your copy now.

**FRICK CO.**  
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THE CORNELL ENGINEER

# Straight talk about your after-college job

## No. 1. An engineer should find out what he can do best

AS A COMPANY made up largely of engineers, we have observed a good many young engineers on their first job.

One thing we have discovered is that each student engineer will have a special ability in some phase of his chosen profession. When given a chance to apply that special ability in the right place, an industrious man usually makes a good beginning.

More often than not however, the student engineer is not sure where his special ability lies. Neither can his first employer be sure. Temperament and personality, we find, have as much bearing as university training on what line of work an engineer should follow.

It quite often happens therefore, that while doing productive work, a man will expose latent talents which he, himself, did not know he possessed.

■ That is why we think it is wise for a young graduate engineer to go with a company which will undertake to give him a varied course in practical experience. It gives him time to "find himself;" to determine what he likes best, and what he can do best.

At The Timken Roller Bearing Company, student engineers are given an opportunity to work in

various departments of our business. While doing productive work, they are watched carefully for the development of special aptitudes. And in the meantime, they get a broad and solid grounding in our policies, products and manufacturing procedures.

■ Our course is particularly valuable and interesting to trainees because the operation of our business requires widely varied engineering skills. We manufacture tapered roller bearings for every industry. And we operate a large alloy steel mill which produces high quality alloy steels in a wide variety of standard and special analyses.

If you will soon be awarded a degree in Metallurgy or in Mechanical, Mining, Chemical, or Electrical Engineering, and you would like to know more about our plan, drop us a line now. The Timken Roller Bearing Company, Canton 6, Ohio.

### The Timken "Work-as-You-Learn" Plan of Training

#### FOR BEARING DIVISION

1. Bearing Manufacture
2. Tapered Roller Bearing Design
3. Industrial Application Engineering
4. Automotive Application Engineering
5. Railway Application Engineering
6. Alloy Steel Production and Sales
7. Purchasing Department
8. Field Engineering Service
9. Sales Order Department
10. Sales Engineering in Field

#### FOR STEEL AND TUBE DIVISION

1. Electric and Open Hearth Melting Shop
2. Steel Rolling Mills
3. Heat Treating (Canton Plant)
4. Bar Finishing and Inspection
5. Tube Finishing, Heat Treating and Inspection
6. Stainless Steel Forge Shop
7. Tool Steel Mill and Forge Shop
8. Production Scheduling Department
9. Metallurgical Laboratory
10. Metallurgical Service (Customer Contacts)

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## THE TIMKEN ROLLER BEARING COMPANY

**PRODUCTS:** World's largest manufacturer of tapered roller bearings. Specialists and large producers of fine alloy steels for industry. Manufacturers of removable rock bits. **U.S. PLANTS:** (All in Ohio) Canton, Columbus, Mount Vernon, Wooster and Newton Falls. **FOREIGN ASSOCIATE PLANTS:** British Timken, Ltd., Birmingham, Wolverhampton, Northampton, England; S. A. Française Timken, Asnières (Seine) France. **SALES OFFICES:** In principal cities.

**A major oil company is reinforcing its technical and supervisory staff in foreign operations.**

**Applications are desired from:**

**ENGINEERS . . .** Chemical, petroleum, electrical, mechanical, civil, structural.

**GEOLOGISTS . . .** Structural, surface, subsurface.

**GEOPHYSICISTS . . .** Computers, party chiefs, interpreters.

**PALEONTOLOGISTS . . .** Micro and macro.

**ACCOUNTANTS . . .** Must have degree in accounting and supervisory experience.

• Liberal salaries are paid. Overseas employees are eligible for the company retirement plan, group life insurance and group aviation insurance. Excellent living conditions prevail. Passport and travel expenses are paid by the company.

*Write to Box No. 17, including full information on the following: Personal Data (age, family status, etc.) Education . . . Details of experience . . . All letters are held as confidential.*

## Cayuga Construction Corp.

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Daniel M. Lazar, '29  
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\* \* \*

We can offer the Services of our Experienced Construction Personnel to help you Design, Prepare both budget and bid Estimates, and Build in this Post War Period

\* \* \*

**INQUIRIES ARE INVITED**

## Architecture

*(Continued from page 22)*

by answering that request. The "nigger" may be asked to letter, ink drawings, or even to do a prospective or two.

The faculty committee with which the student has worked all term, sits with the rest of the jury to hear the final presentation of his thesis. Following this hearing, the jury passes their judgment while the quaking senior chews his nails in the hall. And that night the senior and his "niggers" may be found in places of higher celebration.

## Graduate Study

In the graduate room, one may find a variety of advanced study being made. Mr. Mackesey, professor of city planning, has laid out his maps and models there. Graduates and under-graduate work under him. Other graduate students, who compose a very cosmopolitan group, are working on Master theses in design.

The wartime architectural student has stood in awe of the pre-war problems which hang along

the walls of the hall and drafting rooms. The Rome Collaborative which hangs in the hall on the third floor won that contest in 1938-39. The contest was run on a national scale for a collaborative solution by an architect, sculptor, painter, and

A pretty co-ed glances up from her work with an absorbed expression. Inspiration or daydream?



landscape architect, from each entering school. The standard which these and other pre-war problems exhibit has helped to keep the quality of achievement at a higher level during the war, when the architectural course was necessarily concentrated into four years instead of five, and working against difficult odds, as were all schools.

Much could be said of the artistic expression on the drafting room walls. Some of it was left by the Curtiss Wright Cadets who invaded our sanctuary during the early years of the war. Another part commemorates the Beau Arts Ball, a costume party revived last year from pre-war years. The African motif of 1944 explains the elephants, tigers, and bamboo huts on the walls of the freshman drafting room. The remainder can be accounted for by an artist in a bit of creative relaxation.

The old tub in one corner of the center drafting room has been the site of many a freshman's orientation. Admitting that its original purpose was to soak sketches and

*(Continued on page 26)*

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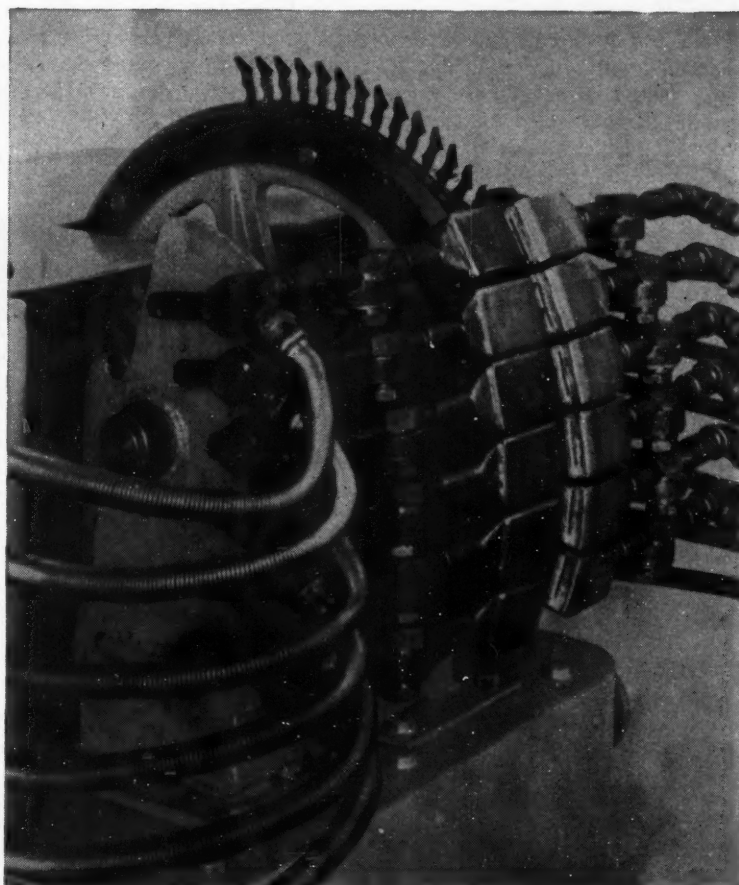
# ***GAS, OUR MOST versatile FUEL, helped saw our way to Victory***



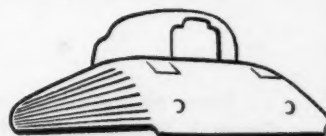
Our troops, moving through tropical forests, found it often necessary to cut down trees of the tough teak family—to make passage or perhaps to use this sturdy timber for their needs. To saw down these trees required a cutting edge that could indeed, not only "take it" but "deal it out."

Sawteeth or bits are removable; they must be extremely hard at the edge, soft and ductile where they are attached to the band of the saw. This calls for specially well controlled heat treating of the part. Gas and modern Gas heat treating equipment solve the problem.

On a circular track they run the gauntlet of 12 slot-type, ceramic cell burners, emerging with exactly the qualities demanded by their stern use. This furnace, operated by a girl, can heat treat 2,000 saw bits per hour, is adaptable to the heat treatment of many other small parts, bringing to bear an intensity of focused heat just where it is needed.



Conversely, in a mid-west plant, Gas furnaces did a most successful job of heat treating large hull castings of tanks, 22 feet long and 10 feet wide. That's a far cry from saw bits but Gas takes both extremes in its stride. The Industrial Engineer of the local Gas Company will check over any heat treating problem—and help put this versatile, modern fuel to work solving it.



## **AMERICAN GAS ASSOCIATION**

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***THE TREND IS TO GAS***

FOR ALL  
INDUSTRIAL HEATING

## Architecture

(Continued from page 24)

as a source for those lurid washes produced in the last desperate hour before a rendu, the tub has become an integral part of the architect's well-diversified activity. This year produced ten freshmen who were judged, pronounced guilty and "tubbed," with due ceremony. If their judges absorbed as much water as the victims, it was only because of their enthusiasm and the fact that the freshman class is slightly over-powering in their number.

At about Christmas time each year the faculty entertains the students at a reception in White Hall. Perhaps, the atmosphere seems a bit more formal than that to which they are commonly exposed. However, once the shock of seeing white shirts and suit coats, silk dresses

and heels on the usually smocked and aproned students has been absorbed along with samplings from plate and bowl, then, all stiffness subsides and the fun carries everyone with it until the yawns of Jim, the watchman, send them on their way home. One may wonder why Jim and cohorts always surround the scene with fire extinguishers before the party gains momentum—

Architecture students relax at a picnic at Flat Rocks.



'tis all in the spirit of the occasion.

There is a temptation to dispel the engineer's illusion of the perpetual party which many believes dissipates the architect's drafting room sessions. The outsider may receive that impression from the architect's tremendous capacity for carefree relaxation. Let the engineer tackle an esquisse or join the gang with a rendu in immediate prospect and we believe he will admire the architect's capacity for enjoying the work in process and relaxing completely before the next program is issued, a spirit shared by faculty and students alike. We've seen wistful engineers drift into the periphery of this atmosphere of complete abandon, at a picnic on Flat Rocks or a freshman welcome in the lower deck of Zinck's. They seem to find the jubilation contagious and the welcome sincere.

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We are expecting, and getting, many registrations of Cornell veterans. They are welcome.

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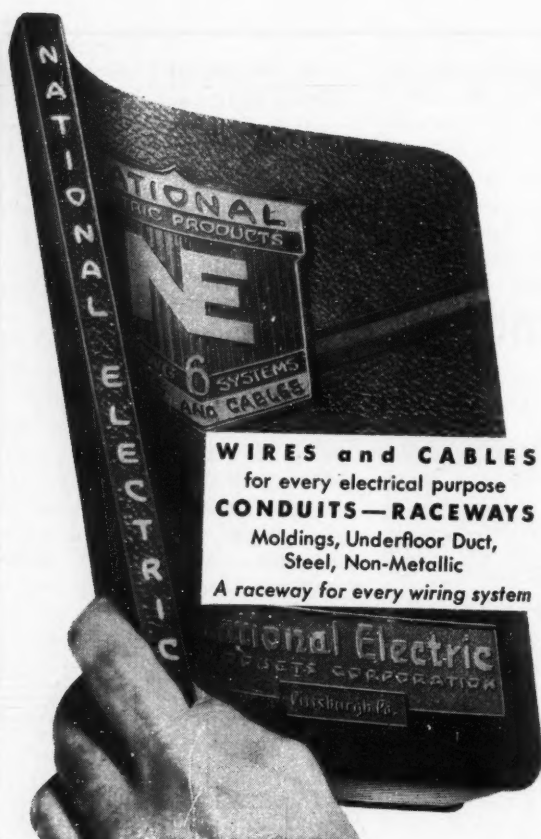
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### Mac Adams

(Continued from page 15)

neering plan. He feels that the practical knowledge given in the fifth year, tied in with cases and examples from the history of the subject, would bridge the gap between theory and practice. Also, additional English and liberal courses could be added to keep engineers from becoming "one-sided."

After earning "millions" as a mechanical engineer, Mac wants to retire to a house on some big lake. There he would like to own all kinds of boats and just "cruise around" the rest of his life.

### College News

(Continued from page 16)

rolled in the School of Electrical Engineering.

Concerning the membership drive, Chairman Alan D. Sutherland said, "Everyone who is qualified is cordially invited to join and attend the frequent meetings that are held. Your Student Branch of the AIEE offers every student an

opportunity for greater education and fellowship in his chosen profession. Your organization can be no stronger than you choose to make it. Join the AIEE now and support its activities."

### Atmos

THE newly elected officers in Atmos are: President, Al Brady, Vice President, Carl Ferris, and Secretary-Treasurer, Charles Cox. John W. Feitner and Richard I. Gavin have been initiated this term. The society's plans include a basketball game in the near future with Rod and Bob.

### Rod and Bob

THE new officers of the Rod and Bob Society are President, Gil Holmberg; Secretary - Treasurer, Pete Pietropaoli; Keeper of the Key, Jim Beckett. Professors Marvin Bogema and Melvin Priest are new faculty members. The new student members are David Fernow, Ed Good, Charlie L'Amoureux, Bill Lawrence, Pat Peterson and Al Roos.

The plans of the society include

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inter Engineer Society Basketball games with Pyramid, Delta Club and Atmos. December 15 a joint party with Pyramid was held at Zinck's after the basketball game.

Rod and Bob welcomes back three new vets this term; Al Wood, Bob McMurtrie, and Bud Dameron.

### Delta Club

ELECTION of officers of the Delta Club was held November 29. New officers are: President, Sam Mutchler, Secretary, Bart Snow, Treasurer, Pete Peterson. Professor B. K. Northrup represented the faculty.

MEMBERS of the Ithaca section of the American Institute of Electrical Engineers held a joint dinner meeting with the Broome County chapter of the New York State Society of Professional Engineers, Friday, December 7th, at 6:30 p.m., in the Arlington Hotel, Binghamton.

The speaker was Chester H. Lang, vice-president of the General Electric Company, whose subject was "Some Engineering Developments That Helped to Win the War."

**THE CORNELL ENGINEER**



## THE FLAME THAT CUTS *Through Sea and Steel*

• The operating subsidiaries of  
Air Reduction Company, Inc.,  
are:

AIR REDUCTION SALES COMPANY  
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• THE OHIO CHEMICAL & MFG. CO.  
Medical Gases—Anesthesia  
Apparatus—Hospital Equipment

• WILSON WELDER & METALS CO., INC.  
Arc Welding Equipment

• AIRCO EXPORT CORPORATION  
International Sales Representa-  
tives of these Companies

Men-of-war that "died" at Pearl Harbor lived again to fight at Omaha beach and Leyte. No small measure of credit for their resurrection belongs to the modern techniques of underwater cutting with the oxy-hydrogen flame and underwater welding with the electric arc. These methods are serving the nation's needs in wartime, and are also opening the way to new peacetime accomplishments in submarine salvage and construction.

Air Reduction has played a leading part in designing and manufacturing equipment for underwater cutting, as part of its program of progress which has given the world many new developments in welding, cutting and other related methods for modern metal-working.



**AIR REDUCTION**

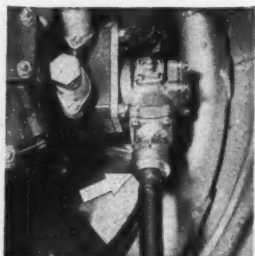
60 East 42nd Street, New York 17, N. Y.

# S.S. WHITE FLEXIBLE SHAFTS

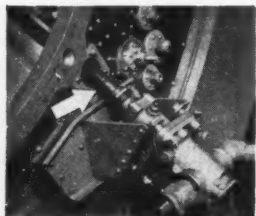
"Metal Muscles" for Power and Control



## They simplify manufacturing and cut production costs



A typical S.S. White power drive flexible shaft application — aircraft fuel pump drive. Above — the geared take-off of the shaft from the engine, and below — the connection to the pump. Aircraft applications of S.S. White flexible shafts total millions of feet annually.



One of the rules in engineering design is to use the **fewest parts** that will accomplish a given purpose — for that means the product can be manufactured easier, faster and at lower cost.

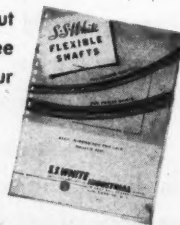
Where your design calls for the transmission of rotational power around turns and in paths other than straight lines, the fewest parts that will do the job is an S.S. White flexible shaft.

This is also true for mechanical remote control. A single S.S. White flexible shaft suffices for smooth, sensitive control between practically any two points.

S.S. White flexible shafts are produced in a large selection of sizes and characteristics in both the power drive and remote control types. A knowledge of the range and scope of both types will be helpful to you in engineering design work. As a preliminary step in acquiring this knowledge, follow the suggestion below.

### WRITE FOR THIS BULLETIN

It gives the basic facts and technical data about flexible shafts and their application. For a free copy, write for Bulletin 4501. Please mention your college and course.



## S.S. WHITE

THE S. S. WHITE DENTAL MFG. CO.

## INDUSTRIAL DIVISION

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FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES  
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## Sulphur

(Continued from page 11)

from twenty-five to thirty per cent amorphous sulfur and is therefore used in the rubber industry.

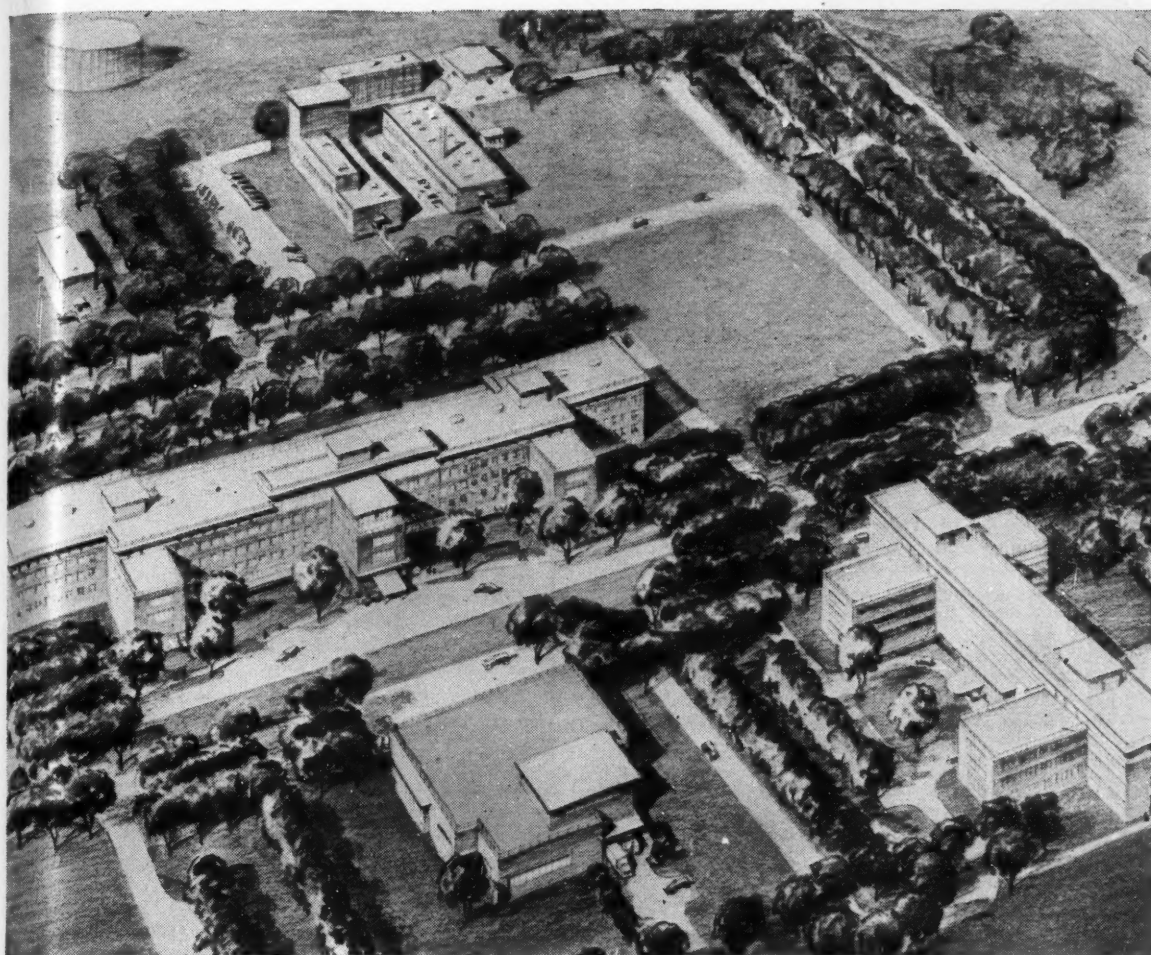
Crude "run of the mine" American sulfur has a purity approaching that of distilled sulfur and has been ground up to use as flowers of sulfur. This grinding takes place in an inert atmosphere. This product is known as sulfur flour. Sulfur flour, which is able to be passed through a three hundred and twenty-five mesh sieve, is used to dust vineyards and also as a cattle dip.

Sulfur may also be obtained in other forms such as: colloidal sulfur, a suspension of small sulfur particles in water; precipitated sulfur, obtained by adding hydrochloric acid to polysulfide solutions; and lac sulfur, obtained when sulfuric acid is added to polysulfide solutions.

### An Important Product

Sulfur is a very important product in the world of today. It is put to huge and widespread use by farmers as an insecticide. It is dusted over cotton crops by airplanes to guard against the insects destroying the crops. Sulfur is used in vulcanization to transform soft and sticky latex from rubber trees into springy rubber for the tires of fast military vehicles and airplanes. Sulfur was found to excel sand in filtering sediment from water and is put to use in this task. Some of the most corrosive chemicals flow harmlessly through pipes made of sulfur. One of the greatest and most extensive uses of sulfur is in the manufacture of that backbone of chemistry, sulfuric acid. Smokeless powder, TNT and fertilizers require for their manufacture that king of chemicals. Cameras would be useless without the use of hypo, another sulfur compound, which makes the picture permanent. In medicine the famous sulfa drugs are becoming more and more important. Sulfur is used in shrink proofing and in fire proofing. Thus it can be realized how important the mining of sulfur can be in producing such common and everyday things which every American now takes for granted.

THE CORNELL ENGINEER



Architects' drawing of the proposed 8 new Esso Research buildings at Linden Park, N. J.

## What is the future of Research Work?

"BIG AND IMPORTANT"—is the answer of the world's largest petroleum company, which expects to spend as much as \$8,000,000 in building two giant new Esso research centers to be located at Linden, New Jersey and Baton Rouge, Louisiana.

This new program will still further enlarge Esso Research Laboratories—already the most modern and extensive petroleum research facilities in the entire United States. And as part of this expanded research

program the staff of Esso scientists and research workers—at present 2100—will be upped at least 20 per cent.

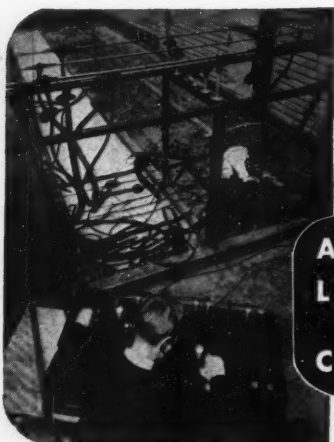
### What sort of work will they be doing?

Basically these new Esso research centers will be devoted to maintaining American leadership in the production of fine fuels, lubricants and chemical products derived from petroleum. Specific research will in-

clude work on the production of liquid hydrocarbons from natural gas, the gasification of coal, and the production of oil from coal and other carbonaceous deposits such as oil shale. Studies will also be conducted on extremely low temperature polymerization, important in the field of new plastics, the further development of Butyl, one of the numerous synthetics originally developed by Esso Laboratories, and hundreds of associated subjects.



UNENDING RESEARCH WORK ASSURES THE HIGH QUALITY OF ALL ESSO PRODUCTS



**AN OUTDOOR  
LABORATORY  
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CABLE STUDY**

Nothing is guessed at, nothing is taken for granted by the engineers in charge of Okonite's cable proving ground. Buried in various types of chemically different and highly corrosive earth, pulled into conduit or installed overhead, electrical cables are tested under controlled conditions of temperature, voltage and loading conditions duplicating those of actual operation.

In use since 1936, carefully-recorded tests made in this "outdoor laboratory" have disclosed valuable trends. As facts accumulate, Okonite engineers apply their findings to the improvement of their electrical wires and cables. The Okonite Company, Passaic, N. J.



**Petroleum**

*(Continued from page 9)*

finery.

Prior to completion of construction, the non-technical personnel selected to operate the plant is thoroughly trained in the normal as well as emergency procedures of operation, in accordance with detailed operating instructions drawn up by the design engineers with the assistance of the plant operating supervisors. When the plant is ready to go on stream, several of the process and mechanical design engineers will be assigned to assist the operating personnel until the plant is operating satisfactorily.

It should be pointed out that in many petroleum companies the engineers employed by the research and development organization are separate from those connected with operations, who are employed by the manufacturing department. The groups in the latter organization, who take over the newly erected plant, contain many types of engineers. It is obvious, however, that some overlap of engineers from both the development and manufactur-



A plant foreman instructs non-technical personnel in both normal and emergency procedures of the plant prior to actual production.

ing departments will occur during start-up operations.

During the initial period of operation, test engineers will be present

**BACK AGAIN !**

**CORNELL BOOKENDS**

Walnut shields with etched bronze Cornell Seals

**\$3.75 pair**

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Attractive wall decorations with bronze Cornell Seals

**\$2.50 each**

**CORNELL SCRAPBOOKS**

White covers with Cornell Seal in red.

Can be used for photos too.

**\$1.75 each**

**THE CORNELL CO-OP**

Barnes Hall

On The Campus



RCA's new television camera has a super-sensitive "eye" that sees even in the dimmest light—indoors or outdoors.

## A television camera "with the eyes of a cat"

As a result of RCA research, television broadcasts will no longer be confined to brilliantly illuminated special studios—nor will outdoor events fade as the afternoon sun goes down.

For RCA Laboratories has perfected a new television camera tube, known as Image Orthicon. This tube, a hundred times more sensitive than other electronic "eyes," can pick up scenes lit by candle-light, or by the light of a single match!

This super-sensitive camera opens new fields for television. Operas, plays, ballets will be televised from their original performances in the darkened theater. Out-

door events will remain sharp and clear on your television set—until the very end! Television now can go places it could never go before.

From such research come the latest advances in radio, television, recording—all branches of electronics. RCA Laboratories is your assurance that when you buy any RCA product you become the owner of one of the finest instruments of its kind that science has achieved.

Radio Corporation of America, RCA Building, Radio City, New York 20. Listen to *The RCA Show*, Sundays, 4:30 P. M., Eastern Time, over NBC.



RCA Victor television receivers with clear, bright screens will reproduce every detail picked up by the RCA super-sensitive television camera. Lots of treats are in store for you. Even today, hundreds of people around New York enjoy regular weekly boxing bouts and other events over NBC's television station WNBT.



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The Lufkin "Anchor" Chrome Clad Steel Tape is the best for student as well as professional use. The chrome plated steel line is extra durable—stands up under rough usage. Coated with smooth, rust-resistant chrome, it will not crack, chip, or peel. Accurate, jet black markings are easy to read, they're recessed so they can't wear out. For free catalog write THE LUFKIN RULE CO., SAGINAW, MICH., New York City.

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## Petroleum

(Continued from page 32)

and the plant can be accepted by the refinery. With this acceptance, engineers from the manufacturing organization trained in process control are permanently assigned to follow closely all operations at the plant, maintaining periodic checks on yields, product quality, and utilities consumption to be used for cost accounting. This information will also be supplied to a technical service group of the manufacturing department for careful examination by engineers who will recommend from time to time changes in operating procedure to meet changing market demands and to make such operations fit the overall refinery operating schedule. These engineers will also design and evaluate minor changes in the processing-equipment so as to further improve product quality and reduce the cost of operations.

The plant supervisors will in most cases be technical men, preferably with chemical, mechanical, or administrative engineering training. Such supervisors are usually select-

ed from the process control and technical service groups of the manufacturing organization where they have received extensive training in handling operating and cost problems.

With the introduction of a new product such as this plastic on the market, some consumers may have difficulties in using the material in the optimum manner. In such cases technical sales engineers will visit each consumer to assist in working out the particular difficulty to the mutual benefit of both parties. These men also aid the salesman in finding new customers for such new products.

## Summary

The above outline has briefly covered some of the important duties of engineers employed in the research, development, and engineering organizations, as well as in operations, operations control, and in sales. It should be pointed out, however, that the list of engineers is far from complete. For instance, no mention has been made of the steam, power, and utilities distribu-

tion engineers, those employed in many specialized fields of service work, the men who conduct regular periodic inspections of all of the processing equipment in the refinery, those who supervise the mechanical shops and the maintenance groups, and many others. Furthermore, only one example of organizing a single project from the research stage to commercial application has been discussed, and this particular example may only apply for the larger oil companies. Obviously, there are several different methods of organizing or handling such projects within a given company, whether it be large or small. In any case, engineers are widely concerned.

The petroleum refining industry has long been recognized for its aggressive application of advances in science and technology. This has been one of the major factors in attracting well-qualified technical personnel to the industry. The achievements of its engineers have been outstanding and there is little doubt that the future of the industry will reflect the continued excellent performance of this profession.

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More

# Du Pont Digest

Items of interest to Students of Chemistry, Engineering, Physics, and Biology

## "Easy Does It"

### with Explosive Rivets

Riveting becomes a simple matter of touch-and-go when the rivets used on a job are Du Pont Explosive Rivets. They're so easy to use, in fact, that a single operator can fire them at the rate of 15 to 20 a minute.

The secret of the explosive rivet is the small charge within the shank. Once the rivet is in place, an electrically heated riveting iron is applied to the head. This fires the charge. Instantly the entire rivet shank expands to fill the drilled hole, and the large, barrel-shaped head which is formed on the blind end of the rivet locks it there to stay.

Explosive rivets are ideal for high-speed blind riveting, and for riveting in hard-to-get-at places. Since in many instances they permit simplification of design and more economical production, they have many uses in the automotive, refrigeration, and other fields.

### Behind the rivet—research

In itself, the explosive rivet appears to be a small and insignificant object. Certainly its size does not reflect the effort and research needed to bring it to its present state of effectiveness.

Yet selection of the proper metals for the rivet required prolonged study by Du Pont metallurgists. Determining the types and mixtures of powder was an assignment for Du Pont explosives chemists. Design of the riveting iron called for the skill of Du Pont electrical engineers. In addition, electronic and mechanical engineers were consulted frequently before the problem was at last solved.

The manufacture and the continuous search for improvement of this rivet are representative of what men of Du Pont, working together, are doing to help American industry to better and faster construction methods.

### Nylon Paintbrush Bristles Synthesized by Du Pont Men

The razor-backed, long-legged swine of the Orient are breathing easier these days, for Du Pont engineers and chem-



ists have developed a paintbrush bristle of tapered nylon that lasts from three to five times longer than the best bristle a pig can offer.

Du Pont men have long known how to spin a level filament of rough, resilient nylon, but a tapered filament was something else. All kinds of ingenious spinning devices were tried and discarded before a taper was achieved by pulling a continuous nylon filament from a special spinneret at a controlled variable speed—thick diameters resulting at slow speeds and thin diameters at fast speeds.

The painter who uses a brush with tapered nylon bristles may never think of it in terms of research. But the problem of obtaining a highly oriented, accurately dimensioned bristle required years of painstaking investigation by mechanical and chemical engineers.

### Rain- and Stain-proof Clothes

Many modern laundries and dry cleaners are now prepared to make almost any garment shower- and stain-resistant by treating it with "Aridex" water repellent, a chemical developed by Du Pont. Practically any "spillage" except grease can be wiped off the protected fabric with a damp cloth.

### Questions College Men Ask About Working With Du Pont

#### "WHERE WOULD MY JOB BE?"

Openings for college graduates may exist in any one of the 37 Du Pont research laboratory centers—chemical, biological, metallurgical, engineering, or physical. Men interested in production or sales may find their opportunity in one of the Du Pont plants or offices in 29 states. Every effort is made to place men in positions for which they are best suited, in the section of the country which they prefer.



BETTER THINGS FOR BETTER LIVING  
...THROUGH CHEMISTRY

E. I. DU PONT DE NEMOURS & CO. (INC.)  
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More facts about Du Pont—Listen to "Cavalcade of America," Mondays, 8 PM EST, on NBC

# STRESS *and STRAIN...*

The second course of the table d'hôte was being served. "What is this leathery stuff?" demanded the corpulent diner.

"That sir, is filet of sole," replied the waiter.

"Take it away," said the diner, "and see if you can't get me a nice tender piece of upper, with the buttons removed."

Father: "Wasn't that young Jones I saw downstairs last night?"

Daughter: "Yes, Dad."

Father: "I thought I issued an injunction against his seeing you any more."

Daughter: "Yes, Dad. But he appealed to a higher court—and Mother said 'Yes.'"

The little Moron's watch had stopped ticking and he tried to find the trouble. Finally he took the back off it, went into the works, and found a little dead bug. "No wonder it doesn't work," he said, "the engineer's dead!"

Skidding is the action  
When the friction is a fraction  
Of the vertical reaction  
Which doesn't result in traction.

New Mrs.: "I'm so glad you like it, Dear. Mother says chicken salad and strawberry tarts are the only things I make correctly."

Hubby: "Which is this, Darling?"

"We had a bad explosion at our house last night. Somebody told Dad the new maid was dynamite, so he decided to investigate. As soon as he touched her, she exploded, Mother went through the roof, Grandma hit the ceiling, and Dad went all to pieces."

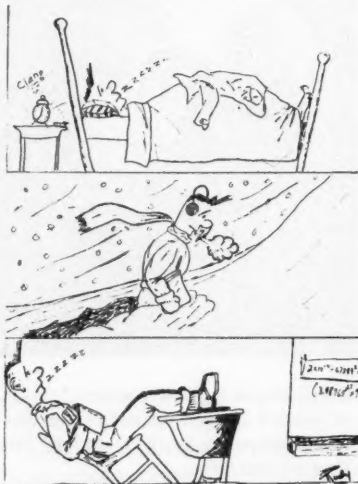
Hotel Clerk: "Why don't you scrape that mud off your shoes before you come in here?"

Van Vleet of the Backwoods: "What shoes?"

The woman autoist posed for a snapshot in front of the fallen pillars of an ancient temple in Greece. "Don't get the car in the picture," said she, "or my husband will think I ran into the place."

"Fishing?"

"No, drowning worms."



A woman went to buy a drinking trough for her dog, and the shopkeeper asked her if she would like one with the inscription "FOR THE DOG."

"It really doesn't matter," she answered, "my husband never drinks water, and the dog can't read."

Hubby: "Doesn't this steak taste queer to you?"

Bride: "I can't understand it. I know I burned it a little, but I rubbed vaseline on it right away."

The absent-minded professor walked into one of the local barber shops, sat down in the chair, and requested a haircut.

"Certainly, sir," said the barber. "Would you mind removing your hat?"

The professor hurriedly complied. "I'm sorry," he apologized. "I didn't know there were ladies present."

Friend: "Was your uncle's mind vigorous and sane until the end?"

Heir: "I don't know, the will won't be read until tomorrow."

"So you think Dora's face is her fortune?"

"I'm sure of it. It runs into a nice figure."

"You're a cheat!" accused the first lawyer.

"You're a liar!" the other retorted.

Then from the judge: "Now that these attorneys have identified each other, we shall proceed with the case."

And did you hear the one about the micron who flooded the gym because he heard that the coach was going to send him in as a sub?

The husband answering the phone said: "I don't know. Call the weather bureau," and hung up.

"Who was that?" asked the wife. "Some sailor, I guess. He asked if the coast was clear."

First Man: "Was her father surprised when you said that you wanted to marry her?"

Second Man: "Surprised? Why the gun nearly fell out of his hand."

There there's the fellow with the stern look because his mother was frightened by the rear end of a ferry boat.

Eng. Physicist: "Archimedes leaped from his bath shouting, 'Eureka! Eureka!'"

Prof.: "What does 'Eureka' mean?"

E.P.: "I have found it."

Prof.: "Found what?"

E.P.: "The soap."

"I'm a man of few words."

"I know—I'm married too."

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THE MAGAZINE